PSYCHOLOGICAL PREDICTORS OF RECOVERY FROM THORACOTOMY IN PATIENTS WITH LUNG CANCER

BY

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Prior research has suggested that patients' capacities to cope with stress are important determinants of recovery from surgery. A coping-vulnerability model developed by Zubin and Spring would suggest that a patient's risk for poor recovery is a function of two orthogonal factors: (1) vulnerability, the patient's inherent predisposition to a particular failure during recovery, and (2) coping, the patient's efforts to master a threatening situation. A patient's coping can be further described by the competencies available to the patient and the coping effort extended during stress.

The present study investigated whether personality constructs generated by this model were potentially predictive of recovery from major lung surgery. It was expected that greater coping effort, more effective competencies, and lower vulnerability would be predictive of better recovery.

Patient vulnerability was measured by an estimate of the extent of surgical intervention. Two measures of competency were included: (1) information seeking as assessed by physician's ratings, and (2) patients' beliefs as to whether their actions determined the course of recovery, as assessed by the Recovery Locus of Control scale (RLC), a measure developed for this study. Three measures of coping effort were used: (1) hope and (2) positive affect were assessed with verbal content measures applied to five minute speech samples, and (3) a patient's willingness to engage in physical effort was obtained from preoperative pulmonary function studies. Additionally, a measure of the social support available to patients was based on a self-report of their contact with significant others. Assessment of immediate postoperative recovery (one week) was done with standard clinical indices, patients' self-reports, and physicians' ratings.

Results showed that recovery criteria were generally independent of one another and that the postoperative period should be conceptualized as a multidimensional process. Concurrent validity and construct validity were established among the competency measures, but the coping effort measures did not intercorrelate with one another as expected. As predicted, vulnerability was independent of coping, and an additional vulnerability measure,

age, was identified. Stepwise multiple regression analyses showed an absence of consistent relationships between individual preoperative predictors and postoperative criteria, although significant predictions were found at the multivariate level. Psychological variables predicted most successfully to criterion of longer term, rather than immediate recovery. Positive affect was negatively correlated with outcome, although the physical effort measure of coping effort functioned as predicted with respect to length of hospitalization. Recovery externals, as measured by the RLC, received less pain medication and tended to have shorter hospital stays. Greater vulnerability was generally predictive of a more difficult recovery course. Although 20 percent of the patients died following surgery, operative mortality was not related to any of the demographic, psychological, physiological, or social variables assessed here.

The results are discussed in terms of the need to differentiate the recovery course into separate components and to frame prediction hypotheses accordingly. The source of variation contributing to operative mortality was not identified in this study and deserves furthur investigation. It is concluded that the coping-vulnerability model offers a productive source of hypotheses, but that more sophisticated measures of coping effort and competency are needed.

CHAPTER I

INTRODUCTION

The psychological literature on adult surgery patients suggests that most if not all patients experience an acute period of anxiety and fear, particularly when surgery is accompanied by threats of death, disfigurement, debilitation, or chronic severe illness. The need to understand the psychological factors of surgical outcome and to design psychological preparations for the experience is predicated upon the belief that surgery is a major stressful event placing all patients at risk for psychological and/or physiological disruption. This has led to considerable interest in identifying pathological mood states or dysfunctional coping patterns that provoke poor response to surgical treatment. In the rush to develop batteries predictive of surgical failure or to understand more thoroughly failures in coping, it has often been overlooked that the majority of adult surgical patients have the where-with-all to adapt successfully to the disrupting effects of illness, hospitalization, surgery, and subsequent recovery. The aim of this study was to offer a fresh view, proposing as an alternative to traditional models a concept of adaptation based on the individual's competencies and effective efforts to master the emotional and objective aspects of the situation. Combined with the knowledge gained from other approaches, this perspective may offer the opportunity of developing a more rounded understanding of surgery and its effects.

Following a literature review of existing work and a proposal to regard the area from the perspective of an individual's competencies, an investigation will be reported that was an initial effort to test the utility of this emerging direction. Previous work has been focused upon a description of the phenomenological experience of the patient, or engaged in teasing out individual variations in coping that are related to different outcomes. It is most appropriate to begin with the descriptive approaches, since these provide the data and clinical basis for more theoretical and experimentally oriented work.

Descriptive Perspectives

The first description and interpretation of psychological experience of the surgical patient were provided by Helene Deutsch (1942). Based on her psychoanalytic therapy with patients who underwent surgery, she placed particular emphasis upon the experience of anxiety and the meaning of the operation in reality and symbolically.

The critical factor in the conquest of operative anxiety was thought to be the amount of preoperative preparation in which the patient engaged. From this view, sudden emergency operations were likely to be followed by traumatic shock reactions, while a more favorable reaction was likely when the patient had time to assimilate the anxiety signal. Assimilation was conceived to be the process whereby the anxiety was perceived and used to initiate preparatory action.

She further suggested that the object of the fear or anxiety about the operation is primarily objective (threat of injury, death) with a significant underlay of symbolic meaning. Deriving from earlier

fears of castration which have been generalized to the whole body, the particular cathexis attached to the diseased organ will determine the amount and intensity of anxiety mobilized.

She was less clear as to exactly what form assimilation takes. She did note that aggressive tendencies were quite common among those anticipating surgery, and these were interpreted as symbolic reactions against punishing parents (replaced by the surgeon). Typical defense reactions (projection, displacement, passivity) were also noted in the case illustrations. Although she does not make explicit statements about preferred means of assimilation, there is the assumption that over-defensiveness to the anxiety signal will stall initiation of adaptation and over-sensitivity to the signal will overwhelm the patient with anxiety. Thus, the most successful adaptation would occur when anxiety is sufficiently strong to prompt preparation, but not so overwhelming as to interfere with assimilation.

Subsequent observers (Meyer, 1958; Titchner & Levine, 1960) noted characteristic experiences of the surgical patient and common defense mechanisms used to handle operative anxiety. Enforced passivity, lack of privacy, and the dislocation from normal occupational and interpersonal patterns were noted as disrupting forces placing additional stress upon the patient. Realistic anxiety about the operation could be compounded by feelings of helplessness, guilt over giving up responsibilities, or vulnerability. The most commonly noted defense mechanism to handle these anxieties was denial. It might be manifested as outright refutation of objective facts, avoidance of perception (e.g., failing to look at the results of mastectomy) or selective misperception. Although Meyer (1958) seemed to feel that denial may

serve constructive purposes in certain situations, observers of this period generally labeled it a pathological process leading to delay in seeking treatment, refusals to cooperate with medical advice, and difficult periods of postoperative adjustment.

These early observations and interpretations laid the groundwork for much additional research. Indeed, the formulation of the role of anxiety initially proposed by Deutsch has proven to be remarkably resilient and will be seen again and again throughout the literature. The primary limitation to these approaches is their heavy emphasis upon pathological coping reactions and the lack of description of the process of successful assimilation.

Improvements in assessment became possible with the availability of psychometric instruments to validate clinical observations. These instruments have demonstrated their value most clearly in the assessment of anxiety. Confirming the earlier observations, scores on measures of transitory anxiety (A-State) were consistently high during the preoperative period and declined to normal levels during convalescence. As expected, scores on a measure of characteristic anxiety (A-Trait) did not change from pre to post surgery, and changing levels of A-State were not related to levels in A-Trait (Auerbach, 1973; Auerbach & Edinger, 1977; Johnson, Leventhal, & Dabbs, 1971; Martinez-Urrutia, 1975; Meikle, Brody, & Pysh, 1977; Speilberger, Auerbach, Wadsworth, Dunn, & Taulbee, 1973; Wolfer & Davis, 1970). The understanding of the patient's experience of anxiety has been refined further by a study which assessed anxiety on each of the first three postoperative days (Chapman & Cox, 1977). A curvilinear response tendency was found, such that anxiety was relatively low prior to

surgery, significantly increased 24 hours after surgery, but decreased again 48 hours after surgery. The apparent inconsistency between these results and those of the former studies probably represents differences in time of measurement. The earlier studies generally obtained measures one week following surgery and thus probably missed the immediate intense changes in transitory anxiety. Chapman and Cox (1977) also found that subjective state reactions varied across operative groups. Kidney donors evidenced markedly less anxiety prior to surgery than kidney recipients or general surgery patients, but became significantly more anxious than the other patients on the first postoperative day. General surgery patients did not evidence the rapid decrease in state anxiety postoperatively as noted in the other groups. These results suggest that the subjective meaning and perceptions of the particular operation effect fluctuations in anxiety.

Correlational studies intended to investigate the relationship between anxiety and recovery provided equivocal results. As initially suggested by Deutsch (1942), Auerbach (1973) found that relative elevations in preoperative anxiety, as measured by the State Trait Anxiety Inventory (STAI), had a curvilinear relationship with postoperative distress, such that patients with relatively high and low increases of state anxiety over their normal level reported more postoperative distress than those patients with a moderate increase in state anxiety. Linear relationships between preoperative state anxiety (STAI) and postoperative levels of state pain (Barkdoll, 1975; Martinez-Urrutia, 1975) and psychotropic drug effects due to anesthesia (Biersner, Harris, & Ryman, 1977) have also been reported. On the other hand, observer and patient rating scales of anxiety have not been found to

be related to postoperative welfare or recovery (Cohen & Lazarus, 1973; Wolfer & Davis, 1970) and two studies (Barkdoll, 1975; Bruegel, 1971) reported nonsignificant relationships between preoperative characteristic anxiety and postoperative pain reports, although a third study (Martinez-Urrutia, 1975) suggested that Hi-Trait anxiety patients experienced more pain both before and after surgery than Lo-Trait anxiety patients. The ambiguity surrounding these results may derive from variation due to alternative criterion measures utilized, different patient populations, and time of assessment.

The importance of time of assessment has been demonstrated in research investigating short-term and long-term recovery from open-heart surgery (Heller, Frank, Kornfeld, Malm & Bowman, 1974). At one year follow-up, one-third of the patients reported significant psychological problems which interfered with recovery. These problems included anxiety, depression, poor self-esteem, somatic preoccupations, and withdrawal. These long term adjustment problems were related to preoperative factors such as (a) reluctance to undergo surgery, (b) poor life adjustment, and (c) and active personality type. However, the occurrence of immediate postoperative dysfunction (delirium, organic brain syndrome) was not related to the preoperative measures, and immediate outcome was not related to one year psychological outcome. Subsequent studies confirmed the independent nature of immediate and long-term recovery among open-heart patients (Rabiner & Wilner, 1976; Rabiner, Wilner & Fishman, 1975). Although the incidence of patients experiencing psychiatric disturbance was found to be similar immediately after surgery and at one year follow-up, the patients with symptoms during the immediate post-operative period were no more likely to

evidence psychiatric symptoms at follow-up than patients asymptomatic during hospitalization. The results suggest that different sets of factors play a role in the onset of immediate postoperative disturbance and long term adjustment. Evidence from another study would suggest that these findings can also be extended to other surgical populations. The investigators (Kolditz & Naughton, 1975) interviewed 200 recovering surgery patients and found that they could identify two phases of recovery: (1) sufficient progress to leave the hospital, and (2) full recovery. The first phase had three major components: resolution of specific operative consequences, resolution of responses to surgery, and physician's validation of their readiness to leave. The second phase involved: the ability to resume normal functioning, complete physical recovery, and assurances from physicians. From these findings it seems clear that investigations of the relationship between personality factors and the recovery course must specify the time and nature of the recovery process being assessed.

Other evidence exists which confirms the clinical impression that surgery is accompanied by a generalized stress response. On self-report questionnaires surgical patients reported more stress than medical patients on factors of "unfamiliarity of surroundings", "loss of independence", and "threat of severe illness" (Volicer, Isenberg, & Burns, 1977). The findings appeared to be related to the unfamiliar machines and surroundings of surgery, the physical consequences, and the knowledge of surgery itself. Sleep is disturbed in both length and quality during the pre and postoperative periods, and may be both a consequence of anxiety, pain, hospital procedure, and a contributor to impaired functioning and slow recovery (Ellis & Dudley, 1976).

Depression has also been noted to increase immediately following surgery, although it tends to return to preoperative levels within two or three days postoperatively (Chapman & Cox, 1977). In comparison to patients presenting at an outpatient department for medical treatment, cancer patients awaiting surgery to reduce intractable pain were more fearful, revealed greater physical distress, and demonstrated a high level of agitation (Hardesty, Burdock, Lenn & Trachtman, 1973). Interestingly, the authors noted that the most distinguishing characteristic of both groups of medical patients was the absence of anger and hostility, a pattern very similar to one presented by depressed psychiatric patients.

Investigators have also used descriptive designs to explore the general hypothesis that personality characteristics will effect a patient's recovery and adaptation. At a general level the hypothesis has been supported by findings of a modest positive linear relationship between ego strength and various measures of recovery (Bultz, 1975; Giller, 1962). Thus, a patient's general capacities to plan, perceive accurately, and maintain reality contact appear related to their overall psychological and physiological recovery course. More important general factors, however, appear to be the patients' subjective perceptions of the operation, and the particular physiological effects of any one surgical procedure. For example, it was noted previously that kidney donors and recipients were significantly different in postoperative mood reactions from general surgery patients, and donors and recipients differed markedly from each other (Chapman & Cox, 1977). These results are not surprising, as they confirm the voluminous clinical reports that comprise the remaining descriptive literature

(see Howells, 1976, for a comprehensive collection of such articles). Drawing upon theory and clinical experience, these observers have repeatedly confirmed Deutsch's (1942) earliest observation that the meaning and effects of particular operations for the individual are crucial factors determining the adaptive tasks and nature of the recovery course.

In summary, descriptive approaches have contributed a basic understanding of the stressful nature of surgery, documenting characteristic mood reactions and intrusive elements of the illness and hospital experience, and appear particularly suited to describing the unique tasks and stressors of a particular illness and operative procedure. Using this as an experiential base, investigators are now turning their attention increasingly to developing over-riding theories or etiological models that can explain response in a broad range of surgical populations.

Etiological Models of Coping and Recovery

The etiological models can be classified into four types: (1) emotion-as-drive models focusing on the arousal of fear and anxiety which lead to constructive preparation or the "work of worrying"; (2) emotion-as-response models focusing on cognitive threat appraisals and the role of emotional and instrumental coping responses; (3) dispositional models focusing on particular propensities of individuals to use one or another coping types; and, (4) situational models focusing on hospital milieu, sociocultural, or contextual variables. The first three models are person centered: the forces emanating from the personality determine the style and manner of coping. The fourth

model is primarily "environmental," in that differences between patients are attributed to environmental rather than personality characteristics.

Emotion-as-drive model

The first investigator to elaborate Deutsch's (1942) description of anxiety and assimilation was Irving L. Janis (1958). In his initial work, Janis (1958) conducted extensive preoperative and postoperative interviews with 23 surgical patients and collected additional information from chart notes. The information derived from these sources was used to classify the patients into one of three preoperative emotional states: high, moderate, and low fear. The postoperative interviews revealed that moderate fear level patients were less likely than others to display postoperative anger, excessive anxiety, resentment, criticisms of staff, and agitation. Low and high fear patients appeared to be unprepared for postoperative stress and were markedly distraught during convalescence. Subsequently, Janis (1958) collected retrospective self-reports from 149 students who had undergone surgery. The correlational results supported the original findings. Additionally, these reports indicated that the provision of information prior to surgery affected recovery. Those patients who were not informed about the surgery reported feeling: (1) little fear prior to surgery, (2) anger during convalescence, and (3) resentment towards the staff.

To interpret these data he advanced the concept of reflective fear (Janis, 1958; Janis & Leventhal, 1965). Once fear is stimulated by the perception of threat stimuli, the person attempts to relieve the negative feelings by remaining vigilant to all features of the threat. By engaging in the "work of worrying," the individual develops realistic

expectations and plans for action with which to meet and survive the impending danger. However, high levels of fear may be unproductive if the person engages in inefficient impulsive behavior or begins to panic. The strong emotional reactions disrupt vigilance, judgment, and increase the probability that extreme forms of avoidance will be used. Similarly, low fear level in the face of realistic threat will not provide sufficient distress to motivate the patient to "worry." The person will remain unaware of threat cues due to indifference. Thus, the model predicts that the person experiencing moderate fear will be the most capable of handling the danger when it finally arises.

In sum, Janis proposed the following sequence of events to explain psychological response to surgery: (a) exposure to threatening stimuli about the impending operation leads to, (b) anticipatory fear which motivates, (c) "worry work" strategies, such as seeking information or reassurance, which lead to (d) accurate expectations, reassurance, and reduced incidence of hostility or distress following surgery.

However, subsequent research has not generally supported the various components of this model. In an effort to replicate Janis' findings, Leventhal (1963 - cited in Johnson et al., 1971) looked at the relationship between 11 measures of preoperative emotionality and various indices of postoperative adjustment. Contrary to the curvilinear model, patients who were lowest in preoperative fear were also lowest in postoperative emotional distress and criticisms of the staff. In a subsequent study (Johnson et al., 1971) levels of preoperative fear were assessed on 62 surgical patients with the Mood Adjective Check List. The authors reported that the relationship

between fear and postoperative distress was generally linear. Patients low in preoperative fear reported less emotional distress than patients high in preoperative fear. These results are compatible with other studies which also found reliable linear relationships between fear and postoperative distress (Biersner et al., 1977; Giller, 1962; Sime, 1976; Wolfer & Davis, 1970).

Tests of the hypothesized sequence between exposure to threat stimuli and final response also present equivocal support. As predicted, Vernon and Bigelow (1974) found that exposure to a preoperative condition which increased knowledge about surgery was related to greater preoperative attention to problems, but exposure was unrelated to self-reports of preoperative fear or worry. Similarly, the extent of a patient's knowledge about the upcoming procedure has been found to be positively related to active coping efforts of information seeking, but self reports of fear were independent of coping activity (Sime, 1976). In contrast, one study demonstrated that patients provided preoperative information about surgical preparation, pains and discomforts did evidence increased anxiety and fear, although this did not lead to less postoperative distress during the recovery period (Langer, Janis, & Wolfer, 1975). One possible explanation for these conflicting findings is that Vernon and Bigelow's failure to provoke fear with their information package was due to relatively less threatening, perhaps more factual information. This view suggests that threat stimuli in the form of information may provoke (1) fear responses or (2) problem oriented responses, but that the two sets of responses are not related to one another and do not necessarily lead to better recovery. Additionally, the type, quality and extent of information

provided may interact with levels of fear or anxiety. One group of investigators (Williams, Jones, Workhoven, & Williams, 1975) found that both brief and extensive supportive preoperative interviews decreased anxiety among high anxiety level patients, but that brief interviews significantly raised anxiety levels among the relatively nonanxious patients.

Where experimental manipulations intended to increase fear levels through exposure to threatening stimuli have not translated to changes in the recovery course, interventions intended to distract the patient from the negative aspects of surgery and to provide instruction in specific coping devices do facilitate the recovery course. Strategies with demonstrated effectiveness include instruction in physical exercises that reduce pain and enhance return of physical mobility (Egbert, Battit, Welch, & Bartlett, 1964; Healy, 1968), preoperative groups that provide support, information and ways the patient can aid in their recovery (Schmitt & Woolridge, 1973), and instruction in a coping device utilizing distraction and cognitive reappraisal through selective attention (Langer et al., 1975).

In summary, the evidence does not support the two basic assumptions of the emotion-as-drive model: (1) fear as a mediating variable between perception and adaptation, and (2) a curvilinear relationship between fear and recovery. In attempts to assess more adequately and to understand these processes several authors have reworked the basic motivational assumptions of the coping model.

Emotion-as-response models

More recent conceptualizations of the coping process have taken as their starting points the mediating function of cognitive appraisal

and the place of emotions-as-responses (Lazarus, 1966; Lazarus, Averill, & Opton, 1974; Leventhal, 1970, 1975). In the most general terms, cognitive appraisal is the primary process which distinguishes the potentially harmful elements of a stimulus from the beneficial or irrelevant. The coping process is not a response primarily designed to reduce the intensity of an unpleasant emotion, but is a response to a cognitive perception of impending danger and potential courses of action. Emotions such as fear or anxiety are reactions to the perception of threat, although they may also serve as stimuli for further threat appraisals. Coping responses may be expressed as additional cognitive modes of resolution (benign reappraisal, attentional refocusing, conflict resolving fantasy) or direct action (avoidance, attack, instrumental activity). The particular coping strategy chosen at any one point in time will be a function of dispositional propensities of the individual, the nature of the threat appraisal, and situational factors (Lazarus et al., 1974).

Leventhal (1970) posits two independent responses to the perception of threat: (1) emotional reactions and efforts to reduce emotion; and, (2) awareness of the objective features of the threat and danger controlling responses to reduce the threat. He suggests that the two classes of responses are independent of one another: they are responsive to separate elements of the threatening stimulus and they do not cause one another. When emotional arousal leads to instrumental action designed to reduce the arousal, the process is fear control. Actions designed to control fear (avoidance, defenses, reinterpretation) may have no effect on the actual danger. Behavior intended to control the objective features of the threat is termed danger control.

Support for this model was provided by a study with 62 female surgical patients (Johnson et al., 1971). Preoperative and post-operative measures of emotion (moods, pain, anxiety) were intercorrelated and generally showed positive linear relationships with one another. Active danger controlling behaviors (requests for information, days-of-hospitalization) and locus of control beliefs also showed positive relationships to one another. But, the measures of emotional and danger controlling behavior were relatively independent of one another.

The implications of this model for medical care are that strategies which enhance the patient's danger controlling coping behavior will improve physical recovery, and techniques designed to facilitate fear control will improve the patient's emotional adaptation. In an initial test of this hypothesis, Johnson and Leventhal (1974) provided two types of preparatory information to patients awaiting an endoscopic examination: (1) a behavioral message, and (2) sensory-descriptive information. The behavioral instructions were intended to improve the patient's danger controlling responses. The sensory-descriptive information was intended to reduce idiosyncratic misinterpretations of the experience and reduce emotionality. As predicted, the sensory-descriptive information successfully reduced emotionality during the examination. However, behavioral instruction altered danger controlling responses only when combined with the sensory information. Although situational factors related to the intensely threatening nature of the examination appeared to have caused the interdependency, the results provided additional support for the model. Similarly, Sime (1976) found that patients who were experiencing high levels of fear and who were well informed about their illness and treatment

received fewer analgesics and sedatives and were hospitalized a shorter period of time than less well informed counterparts. However, both less and well informed patients reported high levels of postoperative negative affect. Since the administration of analgesics and the length of hospitalization are both assumed to be somewhat under patient control, it appeared that the patient's coping actions were independent of their postoperative emotional reactions.

Both Leventhal and Lazarus have developed models with considerable conceptual elegance. Individual interpretations of threat stimuli, coping predispositions, intrapsychic and behavioral coping responses, the role of emotions, and the influence of situational factors have important places in the models. The task for researchers now is to identify specific predispositional, behavioral response, and situational factors which account for the variability in outcome.

Dispositional Models

Dispositional variables reflect potentialities of the individual. They may be organized around coping responses (anxiety, hostility, approach-avoidance); organized around particular stimuli (attitudes, beliefs, values); or conceptualized from theoretical propositions (field dependence-independence) (Lazarus et al., 1974). Coping dispositions are distinguished from the actual coping responses used under particular circumstances. Three dimensions of coping dispositions have been investigated in the surgical literature: internal-external locus of control, trait anxiety, and approach-avoidance.

Internal-external control. The extent to which patients believe they can influence their treatment and recovery is reflected in measures of internal-external locus of control (Rotter, 1966). Internal persons

believe their actions, skills, and efforts determine their experiences, while external persons believe their experiences are determined by luck, fate, or outside forces.

With respect to health related behavior, internal patients have been found to seek and obtain more information about disease (Seeman & Evans, 1962; Wallston, Maides, & Wallston, 1976), to be better adjusted prior to surgery (Kimball, 1972), and to be less anxious preoperatively (Lowery, Jacobsen, & Keane, 1975). On dimensions of surgical recovery partly under patient control, internals stayed in the hospital longer and received more doses of postoperative pain medication (Johnson et al., 1971). In a study of preparatory communication (Auerbach, Kendall, Cuttler, & Levitt, 1976) internals adjusted poorly during dental surgery when provided with general information; however, they adjusted well when specific information regarding procedures and sensations was provided. The opposite relationship was found for externals. The authors suggested that specific information enhanced the internal's propensity to seek and use relevant information. For externals, the specific information may have upset their tendency to attribute control to the environment and jeopardized their adjustment.

Results are limited somewhat by the difficulty in predicting specific health related behavior from measures of generalized expectancies. It may be necessary to develop I-E scales more specific to illness and recovery behavior to predict adequately coping responses (Wallston, Wallston, Kaplan, & Maides, 1976).

Trait anxiety. Trait anxiety, a relatively stable individual disposition to react emotionally to stress, has been related to various aspects of the surgical experience. As indicated earlier,

high trait anxiety patients have higher state anxiety scores than low trait anxiety patients, both before and after surgery; and both groups show similar declines in state anxiety scores from pre to post surgery (Auerbach, 1973; Martinez-Urrutia, 1975; Spielberger et al., 1973). The results suggest that high trait anxiety patients do not perceive surgery to be more threatening than low trait anxiety patients. However, high trait anxiety was related to increased reports of pain during both the preoperative and postoperative period (Martinez-Urrutia, 1975), greater fear of surgery on the first postoperative day (Johnson et al., 1971), and general worrying about hospitalization (Auerbach, 1973). Trait anxiety has not been related to other aspects of physical recovery or manifest coping behavior.

Approach-avoidance. Approach versus avoidant strategies of coping with stress have been conceptualized at the cognitive level as minimization-vigilant focusing (Lipowski, 1970); at the emotional level by avoiding-nonspecific defending (Goldstein, 1959); and behaviorally as tackling-capitulating-avoiding (Lipowski, 1970) or vigilant-avoiding (Cohen & Lazarus, 1973). Although sharing similar constructs, these measures have not demonstrated concurrent validity and may represent independent dimensions (Lazarus et al., 1974).

Several studies have used the Goldstein sentence completion test (SCT) as a measure of the patient's disposition to avoid (avoiders) or to remain vigilant (copers) to the emotional aspects of surgery. Copers were found to take more medication than avoiders, but were not significantly different on measures of days-in-the-hospital, minor complications, or negative psychological reactions (Cohen & Lazarus, 1973). In another study, DeLong (1971) found avoiders typically had

slow complicated recoveries in contrast to copers. A third study found that preparatory information was associated with better recovery among neutrals, but did not improve the recovery among avoiders or copers (Andrew, 1970). The results from these three studies are conflicting; both copers and avoiders have been found to experience difficult recoveries, and those who were expected to make best use of preparatory information (copers) did not. One problem may be the measures of coping disposition do not reflect the actual behavior being employed. This possibility is supported by the finding that the correlation between a behavioral measure of vigilance-avoidance and a dispositional measure was $r = .082$, indicating relative independence (Cohen & Lazarus, 1973).

Another possible explanation for the conflicting results lies in the effect of situational variables. A specific coping behavior may be more useful in certain stressful circumstances or at different points during long periods of crisis. For example, behavioral vigilance is related to slower, more complicated recoveries immediately following surgery (Cohen & Lazarus, 1973); however, an active vigilant orientation towards stress was related to better long term adjustment post-surgery (Boyd, Yeager, & McMillan, 1973). An active vigilant approach may be incompatible with the immediate recovery period, which is marked by incapacitation and pain, while it may enhance long-term recovery marked by growing strength and return to normal activities.

Situational model

Situational variables include hospital-treatment characteristics, the nature of surgery, and sociocultural factors. As in much of

American psychology, situational factors contributing to coping have been the object of very little research.

Recovery has not been found to be associated with social class or years of schooling (Cohen & Lazarus, 1973) or racial group membership (Eisler, Wolfer, & Diers, 1972). In the only study to focus upon cultural and social class variables, Tsushima (1968) found patients with Italian backgrounds showed more overt emotional tension and hostility than presurgical patients with Irish backgrounds. Social class membership was not related to preoperative emotional reactions.

Although social class variables do not appear to be predictive, a more specific set of items concerning occupational, marital, social, educational, residential, and family status was predictive of surgical success among patients with intractable duodenal ulcer (Pascal, Thoroughman, Jarvis, & Jenkins, 1966; Thoroughman, Pascal, Jenkins, Crutcher, & Peoples, 1964). Patients who were relatively environmentally deprived and reported poor early relationships with parents showed poor results at two year follow-up.

Marital and family variables appear to be particularly important aspects of treatment and recovery. The importance of understanding and support from a family has been implicated as a major factor in favorable recovery and long term well-being among colostomy patients (Dlin, Perlman, & Ringold, 1969) and patients with surgically induced facial disfigurement (West, 1973). In an observational study, Eisendrath (1969) noted that mortality among kidney transplant patients appeared to be preceded by a sense of abandonment by a person upon whom the patient depended or whose love was a particularly important part of their lives. None of the patients who survived the transplant had a similar loss.

Environmental variables have clearly been related to long-term recovery. A rich satisfying life context and supportive family are conducive to a return to a fulfilling life style. However, environmental variables related to immediate surgical recovery have not been investigated as thoroughly as the ones predictive of long-term success. Ward milieu, patient-staff interaction variables, architectural and physical design variables, and family variables are potentially important determinants of physician and patient behavior during treatment and recovery.

Summary

The evidence collected in the studies reviewed seems to indicate the following: (a) negative mood states such as fear and anxiety are common among surgery patients, but it is unclear whether they are related to active coping efforts or recovery; (b) the most potent variable is the operative intervention, since the nature and effects of different surgical procedures poses widely varying psychological and physiological demands; (c) the patient's subjective perceptions of the hospitalization experience has a major effect on emotional responses and long term rehabilitation; (d)increasing evidence suggests that emotional responsivity to operative threat is independent of ongoing danger controlling coping action; and, (e) although several important dimensions of coping have been identified (approach-avoidance, locus of control), relatively few specific dispositional propensities, behavioral responses, and situational variables that have a place in a comprehensive model have been noted and researched. From this summary it seems evident that a perspective is needed which would emphasize

identification and assessment of a wider range of attributes of the patient and environment relevant to the adaptive process.

From the standpoint of methodology, the most difficult problem has been the definition and assessment of postoperative recovery. Three particular problems stand out. First, uncontrolled situational variables may have an unknown effect on criterion recovery measures. For example, Johnson, Johnson, and Dumas (1970) found that the frequency of pain medication, length of hospitalization, and occurrence of infection were related to type of operative procedure, while duration of anesthesia was associated with capacity to void. Levels of anxiety during hospitalization have also been associated with the type of hospital and cancer diagnosis (Lucente & Fleck, 1972). These and other factors, such as institutional policies regarding use of medication and length of hospitalization, customary practices of individual nurses and physicians, and the availability of specialized services, may affect criterion measures to the extent that they do not vary as a function of the patients' internal psychological condition or in response to experimental interventions (Wolfer, 1973). Consequently, it is probably an error to pull subject populations from a "general surgery pool," since it is unlikely that they are all exposed to similar conditions and experiences. It can also be expected that operative and treatment procedures will interact with different surgery populations such that criterion measures sensitive to recovery in one group will be confounded in or extraneous to recovery in another group. Comparison of results between studies utilizing different patient populations or criterion measures becomes problematic. One potential solution is to choose a uniform patient population and

carefully select standardized measures tailored to the recovery tasks and demands of that group.

A second problem is the point in time at which assessment of recovery is made. It is probably inappropriate to compare patients assessed during the immediate postoperative period with those assessed much later during recovery, particularly when they have undergone different surgical procedures. The former patients are still struggling with the effects of massive physical assault, while later in recovery the patients' primary tasks are to reassume the social and psychological roles given up during hospitalization. The psychological and situational factors predictive of successful adaptation to these respective periods may be quite different and it is probably wise to regard them as separate areas of inquiry.

The final problem that can be noted concerns the multidimensional nature of recovery and the various criterion sources available to measure progress. Recovery is composed of several classes of psychological, physiological, and social criteria. Investigators have tapped each of these dimensions through patient self-reports, standard clinical indices, and physician and observer ratings. Each of these sources is subject to biases, such as the situational variables noted above, or a patient's efforts to provide socially desirable responses rather than "true" self-assessment (Eisler, Wolfer, & Diers, 1972). Additionally, the salient features of recovery for the patient may be extraneous to the physicians' concerns (Kolditz & Naughton, 1975), and objective clinical indices may provide information about sources of variation in recovery that are independent of patient or physician assessments. Therefore, it is probably wise to sample a variety of recovery criteria from several independent sources.

The aim of this investigation was to assess the efficacy of a vulnerability model in generating new constructs potentially predictive of coping and response to surgery, and to test these constructs on a uniform patient population during a limited period of their recovery.

Vulnerability Model

The model to be considered here is based largely on ones proposed by experimental psychopathologists (Garmezy, 1974; Zubin & Spring, 1977). In common with the approaches taken by previous researchers, this model makes the basic assumption that each surgical patient is to some extent vulnerable to physiological and psychological distress beyond the normal range. In effect, vulnerability is a measurable attribute of the individual: a predisposition to a particular failure during recovery. Factors contributing to a surgery patient's vulnerability include the extent and nature of disease, physical stamina, and the internal makeup or physiology laid down by genetic influences. Some acquired factors might include family experiences, ongoing social involvement, and other life events and roles that enhance or inhibit development of dysfunction (Zubin & Spring, 1977). The highly vulnerable patient is one for whom numerous contingencies of the surgical experience or minimal levels of stress encountered during hospitalization may provoke episodes of breakdown from a normal recovery pattern. Others may have such a low degree of vulnerability that only the most catastrophic events will elicit brief periods of disruption. However, a patient's vulnerability to any particular breakdown is not the only contributing factor and being predisposed does not necessarily produce

dysfunction. Other factors such as the patient's psychological maturity probably contribute to the maintenance of health and equilibrium.

A patient's vulnerability is likely to become evident when internal or external stressors impinge upon the patient. It is overly simplistic to think of surgery generally as a "stressful event." As Deutsch and the many clinical observers who have followed her have noted, the patient's evaluation of different events and experiences during hospitalization and recovery will be a significant determinant of what is experienced as stressful. For one patient the pain, immobility, and intense medical treatment of the first few postoperative days may be quite disturbing, while for another the transfer to a regular ward with less mechanical support and more casual medical supervision may lead to a crisis associated with fears of abandonment and death.

The patient will experience an event as stressful when he perceives a discrepancy between the impinging demands and his awareness of available responses with which to meet the threat (Zubin & Spring, 1977). The resulting stress may be thought of as a strain on the patient's coping abilities.

Coping describes the patient's efforts to master a situation that may be threatening, challenging, or gratifying (Lazarus et al., 1974; Murphy, 1974). A principle set of factors which influences the patient's coping behavior is the competencies which can be brought to bear. In the simplest terms, competence is effectiveness: "it is a person's feeling that he can have a desired effect" (White, 1973). The following are some of the other aspects of coping which must be taken into account: (a) the reflexive actions and instincts adequate to meet

stressors; (b) coping efforts, which may be thought of as persistant trial and error attempts at adaptation; and, (c) development of mastery from successful coping efforts (Murphy, 1974; Zubin & Spring, 1977).

An individual's level of competence is developed by consistently exerting coping efforts to master situations, and consists of the fund of intellectual strategies, social skills, ego defensive maneuvers, and other acquired capacities that are built up over time. Coping efforts are distinct from competencies. Whereas the patient's competencies are capacities, coping efforts are the motivational or attitudinal approach to a particular set of exigencies. Patients' coping efforts are often referred to as their "will to live."

What is the relationship between coping, vulnerability, and recovery breakdown? Zubin and Spring (1977) suggest that when coping is disrupted or is inadequate to meet the situation, the length and severity of an episode of physiological or psychological dysfunction will be determined by the extent of the individual's vulnerability. For the relatively "invulnerable" patient, coping dysfunction may lead to the one "bad night" or the short period of agitation and fear commonly reported by patients during recovery. On the other hand, the highly vulnerable patient may evidence severe prolonged periods of anxiety, physiological trauma, or perhaps death when coping dysfunction occurs.

In trying to predict which patients are likely to experience coping dysfunctions, one must determine in what component of coping breakdown is likely to occur. Will it be the patient's failure to perceive potentially threatening events for which preparation is needed? Is it the diminution of coping effort, inadequate competencies,

or some combination of all three? Following the lead of Zubin and Spring (1977) and in conjunction with the prevailing thought within the clinical and observational literature, coping effort appears to be the most likely marker or indicator of the patient's functional level of coping. This is because coping effort is a more dynamic aspect of the patient which is subject to waxing and waning over time and situations, whereas competencies and cognitive abilities are likely to be more stable attributes. In effect, coping efforts are needed to put the patient's competencies and cognitive appraising into motion. Therefore, this model suggested that an attempt to identify indicators or predictors of coping dysfunction must focus upon variables of coping effort as well as the more well researched competencies.

The purpose of the current investigation was to use this perspective to select variables predictive of poor recovery. Measures judged to be associated with coping effort, competencies, and vulnerability were assessed preoperatively and related to various measures of immediate postoperative recovery. Thus, the effectiveness of each aspect of the vulnerability model in predicting outcome was assessed.

Preoperative coping effort was assessed with measures of hope, positive affect, and physical effort. The first two measures were chosen since they reflected an important aspect of coping effort; that is, the maintenance of positive expectancies and beliefs that a favorable outcome will follow action seems to be a necessary precondition to coping activity. Hope has been noted to be an important aspect of successful psychotherapy (Frank, 1968; Perley, Winget, & Placci, 1971) and hopelessness has been implicated as a predictor of cervical cancer (Schmale & Iker, 1971), and seriousness of suicidal intent

among depressed patients (Beck, Weissman, Lester, & Traxler, 1974). A verbal content measure of hope (Gottschalk & Gleser, 1969) has been significantly associated with the experience of emotional crisis (Gottschalk, 1974), survival time in cancer patients undergoing radiation therapy (Gottschalk, Kunkel, Wohl, Saenger, & Winget, 1969), and psychiatric morbidity following six weeks of intensive psychotherapy (Gottschalk, Fox, & Bates, 1973). A more general measure of positive affect using content analysis of verbal samples has also been developed (Westbrook, 1976). In preliminary analysis this scale has demonstrated adequate construct validity when applied to speech samples from mothers, reallocated women, students in transition, and psychiatric patients. More importantly, levels of positive affect were independent of various negative affects, suggesting that people's experience of negative and positive feelings are independent. Thus, a complete understanding of patients' efforts to cope with events of surgery must take into account their positive expectancies and feelings. As a means of testing this hypothesis, measures of hopelessness (Beck et al., 1974) and fear (Martinez-Urrutia, 1975) were also administered preoperatively to the patients in the present study. It was predicted that hope and positive affect would be significantly correlated with one another, but that each would be independent of hopelessness and fear.

The third measure of coping effort, physical effort, assessed the patient's relative physical striving during a medical examination. It was thought that this measure would be predictive of the patient's willingness to engage in various recovery enhancing physical exercises (walking, coughing, arm and leg exercises) despite pain and lack of

energy. Comparable measures had not been previously reported in the literature.

The social environment in which treatment takes place has also been implicated as a major factor in the patient's efforts to cope with physical and emotional stress (Klagsbrun, 1970; Lipowski, 1970; Moos, 1976). These authors emphasize the role professional caregivers can take in offering support, tailoring treatment to the patient's physiological needs, and increasing the patient's sense of mastery and fate control. In contrast, there is little mention of how the patient's family can be utilized to facilitate treatment. This seems particularly unfortunate since it is this "folk support system" which may be most likely to reinforce or encourage the patient's efforts to cope effectively. Therefore, the extent of social contact between the patient and his family and friends was assessed immediately prior to surgery.

An important aspect of the patient's competencies is a sense of fate control, or belief that one can control events in one's environment rather than being a passive victim of them (Garmezy, 1974). In a related sense, the ability to think abstractly, to gather information, and to be able to consider alternative solutions to a problem should be associated with more effective coping actions. These aspects of preoperative competency were assessed on two dimensions: locus of control and information seeking. From the literature review it was noted that aspects of recovery partly under patient control (medication, length of hospitalization) were related to locus of control orientation. However, it was expected that predicting specific surgery related behavior from a measure of generalized expectancies such as Rotter's

I-E Scale (1966) would be difficult, therefore in addition to the Rotter scale, an experimental scale of locus of control with items specific to recovery behavior was presented to the patients. A measure regarding the extent of the patient's information seeking was also added, since previous research had associated information gathering with both locus of control expectations and recovery behavior. It was predicted that both measures would be related to one another and the adequacy of postoperative coping and recovery.

Finally, a patient's vulnerability to postoperative distress, is partially a function of disease factors and the extent and nature of the operative intervention. Disease which is more widespread or more debilitating and operative procedures which involve extensive excision leave the patient more vulnerable to excess fatigue, infection, generalized debilitation, or severe trauma. Patient's vulnerability in this study was assessed with a measure reflecting the severity of disease and extent of intervention. As the model presented suggested that vulnerability and coping are orthogonal factors predictive of breakdown, it was expected that this measure would be unrelated to preoperative measures of coping effort and competency.

Since several of the preoperative measures used in this study did not have demonstrated relevance to the surgical patient's experience, several additional face valid items concerning health and well-being were pressented to the patient. These were used to establish concurrent reliability, but they were not used as predictors of recovery. They included items concerning: current estimate of health, expectancy for recovery, and anticipated life satisfaction postoperatively.

Since postoperative recovery is generally regarded as a multidimensional construct, a number of measures were used in the present study to assess the patient's physical and emotional responses during the immediate postoperative period. The measures were selected to differentiate between the patients' perceptions of their recovery and standard clinical indices of progress routinely available in medical charts (Wolfer, 1973). The indices chosen included patient self-reports of their postoperative mood and physical status, the amount of pain medication utilized, and the length of hospitalization and intensive care. Although not used as dependent variables in the analysis of relationships between the recovery course and postoperative variables, physicians' ratings of the patients' progress were also obtained to observe the concurrence between the physicians' perspective and the other measures of recovery. Since it is likely that the nature of the tasks and demands impinging upon a patient change over the entire period of recovery, postoperative data collection was confined to the immediate postoperative period to add greater precision to prediction.

Statement of hypotheses

It was predicted that (a) measures of vulnerability to poor recovery would be independent of measures of coping; (b) levels of positive affect and hope would not be related to reported feelings of hopelessness or fear; (c) a measure of locus of control orientation specific to recovery behavior would demonstrate better construct validity than a general dispositional measure of locus of control; (d) patients demonstrating greater coping effort, as assessed by a high degree of hope, positive affect, and physical effort, would have more

satisfactory recoveries; (e) internals on locus of control and those who sought more information about their illness and treament would experience better recoveries due to their greater preparedness; (f) patients who received greater social support from significant others would demonstrate more effective coping during the preoperative period and would have relatively good recoveries; and (g) patients with greater vulnerability, as assessed by extent of operative intervention, would show poor recoveries.

CHAPTER II

METHODS

Subjects and Setting

The subjects were 54 patients admitted to the Shands Teaching Hospital (n=17) and the Gainesville Veteran's Administration Hospital (n=37) as candidates for major pulmonary resection for lung cancer. All of the patients were under the care of physicians who were faculty or residents from the Department of Cardiothoracic Surgery at the University of Florida, Gainesville, Florida.

The final sample, or "resected group," consisted of 35 patients who actually underwent lung resection. An "unresected group" consisted of the remaining 19 patients who, at the time of the operation, were found to be unresectable, had "minithoracotomies," or were found not to have bronchogenic carcinoma. Final diagnoses in the unresected group included bronchogenic carcinoma (unresectable), tuberculosis, benign tumor, and nontumorous lung abnormality. Preoperative data were collected from the unresected sample, although it was excluded from postoperative data collection. Data were discarded from two patients who agreed to participate, but were unable to complete the paper and pencil protocol.

The patients in the resected group underwent pneumonectomy (n=7), double lobectomy (n=1), single lobectomy (n=23), and wedge resection (n=4). Seven patients in the resected group and one patient

in the unresected group died during recovery. Both of the patients who could not complete the preoperative protocol had pneumonectomies, and both died during recovery.

Table 1

Sample Characteristics of the Resected and Unresected Groups

Variable	Unresected	Resected
Age in years		
Mean	57.5	58.1
SD	12.2	10.1
Sex		
Male	15	32
Female	4	3
Race		
White	16	27
Black	3	8
SES		
Upper middle	0	1
Middle	4	7
Lower middle	4	15
Lower	11	12
Hospital		
Shands	10	7
VA	9	28

Preoperative Measures

Hope Scale (HS).

Gottschalk and Gleser (1969) developed a Hope scale that is based upon content analysis of speech. Content categories were derived from their definition of hope as: "A measure of optimism that a favorable outcome is likely to occur, not only in one's personal earthly activities but also in cosmic phenomena and even in spiritual or imaginary

events" (Gottschalk, 1974). Five minute speech samples were elicited from the patients in response to the following standardized instructions: "I would like you to speak into the microphone of this tape recorder for five minutes about any interesting or dramatic personal life experiences you have ever had. While you are talking I would prefer not to answer any questions, so if you have any questions please ask them now." The instructions were purposely designed by Gottschalk and Gleser to be ambiguous in order to maximize the projective aspects of the task, and to minimize the effect of the interviewer's behavior.

The speech samples were recorded, transcribed, and claused by the investigator. Two independent raters -- both master's level counselors -- were trained to acceptable levels of interscorer reliability (r=.87) and then presented patient transcripts for scoring. Scores were summed across categories and to overcome the effect of verbal fluency a correction factor that is applied to the Gottschalk-Gleser scales was used, such that:

$$\underline{HS} = \text{Total score} \times CF$$

where CF is the correction factor, the number of words in the sample divided into 100. The scores were averaged across raters to yield a final hope score for each patient. Rater reliability on the summed HS scores for the patients' speech samples was r=.96. Reliabilities on the seven content categories ranged from r=.65 to r=.91. The alpha reliability was .60 and corrected item to scale correlations ranged from .27 to .48.

Positive Affect (PA).

The patients' speech samples were also scored on the Positive Affect scale (Westbrook, 1976), which was designed to provide a measure

of the patient's state experience of positive feelings. The independent raters credited each clause with a score of one for any clause in which the patient expressed positive feelings. The scale assumes the speaker has identified with main characters in recollections or third person accounts, and the character's positive affects are also scored. The standard Gottschalk-Gleser correction factor was applied to summed scores and a square root transformation was done to overcome the positive skew to the distribution. Scores were averaged across raters to yield a final Positive Affect score for each patient. Rater reliability across the patient population was r=.95.

Physical Effort (PE)

Rather than relying upon self-reports or a psychiatric history to make predictions about the level of physical effort that could be expected from each patient, a behavioral measure[1] derived from preoperative pulmonary function tests was used. The pulmonary function studies done as a standard part of the preoperative workup of these patients yield several indices, including measures of forced expiratory volume (FEV), and maximal voluntary ventilation (MVV). The patient's $FEV_{1.0}$ is the volume of gas expired by maximal effort in the first second. The patient's MVV is the maximal volume of gas that can be breathed per minute by voluntary effort. A patient's MVV should be sixty times greater than the $FEV_{1.0}$ when the patient is working at maximal effort. But the patient's MVV is probably more responsive to effort, since it requires some persistence on the patient's part to continue deep

[1]Suggested by Joel Tobias, M.D., a cooperating surgeon on the faculty of the University of Florida

breathing for the required time (15 seconds). The $FEV_{1.0}$ is less responsive to this confounding effect since most patients can be expected to put forth their maximum effort for the short interval (1.0 seconds) required. Therefore, the ratio of the patient's predicted MVV ($FEV_{1.0}$ x 60) and the actual MVV would be a relative measure of the patient's effort, and was used in this study as a measure of "how hard the patient is trying." This measure seemed particularly relevant to the present patient population, since deep breathing and coughing are important postoperative exercises in which the patient must engage to avoid complications (e.g., pneumonia) following surgery.

Each patient's MVV and $FEV_{1.0}$ was taken from the standard Pulmonary Medicine consultation form placed in the medical chart.

Recovery Locus of Control (RLC).

To explore the efficacy of a locus of control scale more specific to the recovery situation, 15 items written as face valid measures of locus of control related to surgical recovery were presented to the patients. Using a six point Likert type format, scored in the external direction, the items were adapted from the Health Locus of Control scale (Wallston, Wallston, Kaplan, & Maides, 1976) and the Rotter (1966) I-E scale. An item analysis was run and items were chosen that showed significant item to scale correlations ($r > .24$) and distribution of response choices. From the original pool, eight items were selected for the final scale (see Appendix A). The resulting RLC scale has a potential range from eight (8) to 48. The mean scale score for this sample was 26.53, and the standard deviation was 9.03. The alpha reliability was .68 and corrected item to scale correlations ranged from .20 to .59.

Information Seeking.

This scale was developed for the purpose of measuring patient differences in information gathering from physicians. Two physicians responsible for preoperative preparation of the patient were asked to rate the extent to which the patient requested clarification or additional information about illness and treatment. They were requested to respond by rating the patients on a six point scale ranging from "no information seeking" to "extremely active information seeking" (Appendix B). When two ratings were obtained, they were averaged to yield one scale score. When only one rating was obtained, the patient was assigned that score. Only 25 patients could be used in the analysis of rater reliability on the scale, since the physicians did not return two independent ratings on 29 patients. For this selected sample the interscorer reliability was r=.89, although whether the physicians always responded independently is doubtful since there was little control over their discussion of a patient with one another.

Social Contact (SC).

Since measures of quality, type, and intensity of support from family and friends were not available, a measure was developed to assess the extent of contact between a patient and his family and friends immediately prior to surgery. The patient was simply asked to indicate the number of phone calls he had made or received, the number of letters written or received, and the number of visitors received in the hospital, all over the 24 hours preceding assessment. The frequency of phone calls, letters, and visitors were summed to yield one score of "frequency of contact."

Extent of Operative Intervention (EOI)

A measure was needed to assess the relative degree of physiological impairment imposed upon the patient by disease and operative factors. The measure chosen was a thoracic surgeon's estimate of the average percentage of total lung tissue (of one lung) removed during resection. Patients were scored on the following basis: pneumonectomy-100%, double lobectomy-75%, single lobectomy-50%, wedge resection-5%. This was intended to reflect the extent of invasion of the cancer, the severity of the operation, and the relative loss in pulmonary capacity.

Validational instruments

In addition to the measures already described, two standardized instruments and four one item scales designed for the present study were presented to the patients as part of the preoperative protocol. These measures were intended to provide means of establishing concurrent validity among the preoperative measures.

The Beck Hopelessness Scale (BHS) (Beck et al., 1974) was developed to provide a measure of a person's negative expectancies concerning self and future life and was used in the present study to test the hypothesis that positive affect and hope were independent of negative mood and expectancies. The scale has been found to have adequate internal consistency and showed a high correlation with clinical ratings of hopelessness (Beck et al., 1974). It consists of 20 true-false items drawn from a pool of pessimistic statements by depressed patients and from a test of attitudes. Each response is given a score of 0 or 1 and the total hopelessness score may range from 0 to 20. Additionally, the Rotter (1966) I-E Scale was presented to the patients and scored in the external direction. This scale was entered into the

protocol to serve as a means of testing the concurrent validity of the RLC.

The Fear of Surgery Scale (FSS) was adapted from one used by Martinez-Urrutia (1975) and was worded: "In general, how much fear or concern do you have about this operation?" Patients were requested to respond by placing themselves on a six point scale ranging from "no fear" to "extreme fear." Martinez-Urrutia found that patients reporting high fear of surgery were more anxious prior to surgery than low fear patients. Scores on the FSS remained stable from pre- to post-surgery, despite declines in A-State scores, suggesting that the scale measures stable or trait dispositions.

The Future Satisfaction (FS) scale was intended to measure the extent of the patient's optimism about the quality of life following surgery and was worded: "How satisfying do you expect your life to be following recovery from surgery?" Patients responded by rating themselves on a six point scale ranging from "very unsatisfying" to "very satisfying." The patients were also asked to indicate their Self-Estimate of Health (SEH) and their Expectations for Recovery (EFR). The SEH was worded: "In general, right now, would you say your health is excellent, good, fair, or poor?" The EFR was similarly worded: "Do you expect your recovery to be excellent, good, fair, or poor?" Responses to both items were scored from one (poor) to four (excellent).

Postoperative Recovery Measures

Clinical indices

In consultation with a thoracic surgeon, four measures of recovery which were judged to be good markers of progress were taken from the

patients' charts: days-to-discharge, amount of pain medication, time in the surgical intensive care unit, and time on ventilator.

Days-to-discharge (DAYS) was defined as the number of days hospitalized in the postoperative period. The day of discharge was counted as one day; the day of the operation was not counted.

The amount of pain medication (MEDS) was determined by first recording from the chart the frequency, quantities, dosages, and types of analgesics administered to the patient during the first seven postoperative days. A standard multiplier was applied to the total quantity of each analgesic to yield its equivalent in milligrams of morphine (Goodman & Gilman, 1975) and the resulting morphine equivalents were summed to yield one score such that:

$$\text{MEDS} = \text{Morphine}_{mg}\ (1.0) + \text{Codeine}_{mg}\ (.083) + \text{Demerol}_{mg}\ (.111) + \text{Percodan}\ (.800) + \text{Darvon}_{mg}\ (.048) + \text{Tylenol}_{gr}\ (.540)$$

Tylenol (#s 1, 2, 3, 4) and Darvocet were recorded from the chart according to their respective components of Codeine, Tylenol, and Darvon.

Time in surgical intensive care unit (SICU) was defined as the number of hours the patient remained in the SICU immediately following surgery. The attending physicians determined when a patient would be transferred to a regular ward.

The time on ventilator was defined as the number of hours during the postoperative period the patient received mechanical breathing support by means of ventilation. However, it was found that initiation and termination of ventilation was not reliably reported in the chart and collection of data on this variable was discontinued during the study.

Self-report measures.

In addition to the clinical indices, two self-report measures were used: the Welfare Inventory and the Recovery Inventory.

The Welfare Inventory (Wolfer & Davis, 1970) is a 20 item self-report measure designed to assess the patient's emotional state following surgery. The patient rates each mood adjective on a six point scale ranging from "not at all" to "very much." In preliminary testing with the inventory, it was found that thoracotomy patients were unable to make reliable or valid discriminations on the six point scale due to their general fatigue and inability to attend. Therefore, the scale was modified such that patients were asked to indicate whether they were or were not experiencing each of the 20 moods. Items were scored in a positive direction (0 or 1), thus scale scores could range from 0 to 20 (see Appendix C). For the sample in this study, corrected item to scale correlations ranged from -.04 to .85 and the "Kuder-Richardson Formula 20" coefficent alpha for dichotomous items was .90. One item was not significantly correlated to the corrected total scale score (Hopeful, r=-.04). The inventory was administered to patients on postoperative day three (WI3) and postoperative day seven (WI7). Since performance on the inventory was similar for both days of administration (r=.71), the scores were averaged across days to yield an overall welfare score (WI). In the case of one patient who died on the sixth day postoperatively and two others who were unable to respond on the seventh day, scores from the third day were taken as the overall welfare score.

The Recovery Inventory (Wolfer & Davis, 1970) is a 14 item self-report measure that asks the patients to rate their physical well-

being on such dimensions as appetite, urination, pain, and ambulation. The patient is asked to respond by rating self on six point scales defined for each recovery item and to estimate the number of times he has been out of bed on that day. As with the Welfare Inventory, preliminary testing with the Recovery Inventory indicated that thoracotomy patients could not make reliable discriminations. For the present study, the item scales were revised to three point and five point discriminations (Appendix D). The Inventory yielded two measures: a recovery score and a self-estimate of the percentage of time spent out of bed that day. The recovery score was a summation of 10 items such that the total score could range from 10 to 50. As with the original Recovery Inventory, items concerning nursing and medical care and ambulation were not included in the recovery score. For this sample, corrected item to scale correlations ranged from .30 to .73 and coefficient alpha was .83. The mean scale score was 31.6 and the standard deviation was 9.4. The last item in the inventory was scored as a separate measure: percentage of time out of bed. Three items (medical care, nursing care, number of times out of bed) were not included in data analysis. The Recovery Inventory was administered in conjunction with the Welfare Inventory on post-operative day three (RI3) and seven (RI7). Scores were averaged across days to yield an overall recovery score (RI). The time spent out of bed was scored as two dependent variables(%OB3, %OB7). Minimum scores were given on the seventh day administration to one patient who died on the sixth post-operative day and to two patients who were comatose and unable to respond.

Recovery Index.

This index was devised to provide a composite measure of recovery that could be used as a dependent variable in the analysis of the relationship between the recovery course and preoperative variables. To develop this index, six postoperative variables (MEDS, %OB3, %OB7, WI, RI, SICU) were used as predictors in a discrimnant function analysis to two apriori groups: survivors and nonsurvivors. The resulting discriminant function score for each patient was their INDEX score, a linear composite of the six postoperative variables. For the overall analysis, Wilk's Lambda = .4935, which was significant ($p < .025$). The standardized coefficents and univariate analyses of variance are presented in Table 2. The positive pole of the discriminant function was associated with longer time in SICU, whereas the negative pole was associated with more time spent out of bed and relatively more positive affect on the Welfare Inventory. The Recovery Inventory and amount of pain medication did not add considerable predictive

Table 2

Results of Discriminant Function utilizing Postoperative Variables as Predictors of Survivors-Nonsurvivors.

Variable	Standardized weight	F
%OB3	-.413	5.48[a]
%OB7	-.262	4.96[a]
SICU	.486	8.05[c]
MEDS	.047	.01
WI	-.475	9.59[c]
RI	.018	6.50[b]

a $p < .05$
b $p < .01$
c $p < .001$

power, partly because of shared variance with other predictors. For membership in Survivor-Nonsurvivor groups, the six measures classified patients with 85.7% efficiency, misclassifying seven patients.

Physicians' postoperative ratings.

A physician's rating scale was developed to provide an overall measure of recovery that could be used to compare results from the patient's self-reports and clinical indices with the physician's perspective. It was worded: "Compared to other patients who have undergone a similar operative procedure, I consider this patient's overall recovery at this point in time to be:". The physicians were asked to respond by rating the patient on a five point scale ranging from "very poor" to "very good."

Procedure

Patients were referred by the Department of Cardiothoracic Surgery at the University of Florida, Gainesville, Florida. After the surgeon had informed the patients as to the nature of their illness and the necessity for surgery, the patients were approached individually in their hospital rooms by the investigator or by one of two male undergraduate psychology students serving as research assistants. After the patients had signed the consent form the examiner went through a standard interview, asking for demographic information and presenting the social contact, self-estimate of health, and estimate of recovery items. The patients were then read the standard instructions for obtaining verbal samples and the patients' speech samples were recorded on a cassette recorder. After the patients had provided the verbal sample, they were given the remaining paper and pencil instruments (BHS, RLC, I-E scale, FS, FSS) and asked to complete these

on their own. The examiner returned later to obtain the completed questionnaires. In some cases, the examiner made the assessment that the patient would be unable to complete the questionnaires, due to poor eyesight, short attention span, or poor verbal comprehension. In these cases, the examiner presented all items orally while the patient followed along and responded, or remained with the patient and provided assistance when needed. Two patients did not appear to have the intellectual capacity to complete the questionnaires and were dropped from the study. Additionally, forms to assess information gathering were distributed to two physicians responsible for the patient's preoperative preparation.

Within the first three postoperative days, the patient's chart was inspected to determine whether a thoracotomy or lung resection had been performed, and whether bronchogenic carcinoma had been found. If any of these criteria were not met, the patient was dropped from further data collection. Those patients who had undergone lung resection for cancer were approached by the examiner on the afternoons of the third and seventh postoperative days. The examiner read all items from the Welfare and Recovery Inventories and recorded the patients' responses. Following the patient's discharge or death, physicians' and nurses' notes and medication charts found in the medical charts were examined to determine the amount of medication, time in SICU, and number of postoperative days in the hospital. Rating forms to assess overall recovery were distributed on the third and seventh postoperative days to a physician responsible for the patient's postoperative care.

CHAPTER III

RESULTS

For the analyses of relationships among preoperative variables, the resected and unresected groups were combined. Potential mean score differences on the preoperative variables as a function of group membership were evaluated with a set of t-tests. There were no significant differences except for a marginal indication ($t=1.92$, $p. < .062$) that the resected group reported more operative fear (FSS $\bar{X}=2.57$) than the unresected group (FSS $\bar{X}=1.83$). In the resected group, pulmonary function tests were not done or not recorded on the chart on nine patients, and these were removed from analyses involving physical effort.

The resected group ($n=35$) was analyzed for relationships among postoperative variables and relationships between the course of recovery and preoperative variables. Only 30 patients were used in analyses of the physician's postoperative ratings since ratings on five patients were not obtained. The number of hospital days was not an appropriate measure for the seven patients who died, therefore only the 28 patients who survived were included in analyses of relationships between days-to-discharge and preoperative variables.

Relationship between Patient Demographic Characteristics, Hospital Setting, and the Recovery Course

The relationship between the postoperative recovery variables and the patient's age, race, marital status, socioeconomic status (SES), and admitting hospital was examined in an initial series of analyses. The SES of each patient was determined from an index of social position based on a weighted sum of two factors: occupation and education (Myers & Bean, 1968). Race, marital status, SES and admitting hospital did not show main effects for any of the post-operative measures, nor could patients in the two hospitals be differentiated by any demographic variables. Age was positively correlated with time in the SICU ($r=.35$, $p < .05$) and the composite INDEX measure of recovery ($r=.33$ $p < .05$).

Preoperative Measures

The relationships between the preoperative variables and the patient's age, race, marital status, and SES, and the hospital of admission were examined initially. Age was not significantly correlated with any of the preoperative measures. The distribution of SES membership was collapsed from the standard five positions to three: I. Middle to upper middle class (n=12), II. Lower middle class (n=18), III. Lower class (n=24). Analyses of variance indicated main effects for SES on information seeking ($F=8.103$, $p < .001$), Recovery Locus of Control ($F=2.729$, $p < .077$). The mean scores for each variable by SES level appear in Table 3. It may be noted that lower class patients tended to seek less information from physicians, to adopt a more external locus of control, and to have less preoperative contact with family and friends than lower middle to upper class patients.

Table 3

Mean scale scores on the IS, RLC, and SC as a function of SES

SES	IS	RLC	SC
I	6.55	24.00	4.75
II	6.88	22.00	3.07
III	3.63	30.39	1.44

Patients were also divided into Married (n=31) and Nonmarried (n=23) groups. As might be expected, married patients reported more social contact (SC $\bar{X}$=4.04) than nonmarried patients (SC $\bar{X}$=1.32, t= -2.65, p. <.013). Interestingly, the Nonmarried group had a higher mean Hopelessness score ($\bar{X}$=5.65) than the Married group ($\bar{X}$=2.40, t=3.08, p. <.004).

T-tests to analyze the effects of race indicated that Blacks sought less information (IS $\bar{X}$=3.33) than Whites (IS $\bar{X}$=6.00, t=2.54, p <.014) and Blacks reported less preoperative social contact (SC $\bar{X}$=1.00) than Whites (SC $\bar{X}$=3.48, t=3.03, p <.004). The mean score differences associated with racial group membership is probably an artifact, since all but one of the Black patients fell into the lower class. Therefore, the results suggest that lower class patients, in general, sought less information, had less preoperative contact with friends and family, and tended to attribute control of events to the environment.

Potential mean score differences on the preoperative variables as a function of hospital of admission were analyzed with a series of two-tailed t-tests. Patients in the Shands Teaching Hospital had significantly higher I-E scale scores (t=2.9, p <.03) and higher

estimates of future satisfaction ($t=2.65$, $p. < .01$) than patients in the Veteran's Administration Hospital. Significant differences were not found on the remaining preoperative variables.

Intercorrelations among preoperative variables.

As an initial step in assessing the validity of the preoperative measures, the intercorrelations among preoperative variables were calculated using data from both groups.

As Table 5 indicates, concurrent validity of the verbal content measures of hope and positive affect was demonstrated by a .86 correlation ($p. < .001$) with one another. As predicted, neither of these measures was significantly related to negative mood states of operative fear (FSS) or hopelessness (BHS), and both hope and positive affect were positively correlated to the single item measure of future satisfaction (FS). They were also moderately correlated with RLC, such that more expressed positive affect was associated with a stronger external locus of control orientation. However, the .86 correlation between hope and positive affect indicates that the scales shared 74% common variance and it is therefore doubtful that the Hope scale was providing a more precise differentiation of a particular mood state than the more generalized measure of positive affect.

In contrast to the strong positive relationship between these two verbal content measures of coping effort, hope and positive affect were negatively correlated at a moderate level with the physical measure of coping effort. Additionally, physical effort was positively related to operative fear, such that greater fear tended to be associated with more physical effort. Physical effort was not related to either of the locus of control scales nor to the remaining validational

Table 4

Mean, Standard Deviation, and Range of Preoperative Variables

Variable	Mean	SD	Minimum	Maximum
Hope	2.52	3.20	-2.23	13.15
Positive affect	1.34	.61	.34	3.20
Physical effort [1]	.32	.31	0.00	.85
Recovery I-E	26.53	9.03	8.00	43.00
Information seeking	2.28	1.56	1.00	6.00
Social contact	2.77	3.99	0.00	22.00
Hopeless-ness	3.81	3.82	0.00	18.00
Fear of surgery	2.28	1.31	1.00	6.00
Future satisfaction	5.09	1.30	1.00	6.00
Estimate of health	2.93	.95	1.00	4.00
Estimate of recovery	2.00	1.03	1.00	4.00
Rotter I-E	7.98	3.71	0.00	16.00

Note [1] n = 45

Table 5

Correlations among Preoperative Variables

	Positive affect	Physical[2] effort	Recovery I-E	Infor. seeking	Social contact	Operative[1] interven.	Hopeless-ness	Fear of surgery	Future satis.	Estimate health	Estimate recovery	Rotter I-E
Hope	.86	-.29[a]	.26[a]	.06	.10	.05	-.17	-.08	.32[a]	.03	.04	.00
Positive affect	1.00	-.32[a]	.30[a]	-.11	.09	.14	-.06	-.08	.30[a]	.09	.17	.06
Physical[2] effort		1.00	-.10	.07	-.12	-.06[3]	-.02	.30[a]	-.16	.10	.11	.01
Recovery I-E			1.00	-.41[b]	-.14	-.12	.16	-.13	.23	-.16	.05	.32[b]
Infor. seeking				1.00	.14	.07	-.35[a]	.12	.21	.25	.24	-.53[c]
Social contact					1.00	.02	-.26[a]	.01	.06	.13	-.10	-.32[a]
Operative[1] interven.						1.00	-.25	-.53[c]	.26	.26	.06	.09
Hopeless-ness							1.00	.11	-.59[c]	-.27[a]	-.25[a]	.44[c]
Fear of surgery								1.00	-.03	.30[a]	-.06	.09
Future satis.									1.00	.30[a]	.47[c]	-.22
Estimate health										1.00	.27[a]	-.25[a]
Estimate recovery											1.00	-.33[b]

Note[1] n = 35
Note[2] n = 45
Note[3] n = 26

a p < .05
b p < .01
c p < .001

instruments. In summary, concurrent validity among the three measures of coping effort was only partially established, and there was some indication that there were two response clusters; one associated with fear-physical effort and another associated with positive affect-future satisfaction-external recovery locus of control.

Concurrent validity of the RLC was shown by a .32 correlation ($p < .01$) with the Rotter I-E scale, indicating that the new scale shared about 10% common variance with the I-E scale. Moderate construct validity of the RLC was also demonstrated by a significant negative correlation with information seeking (τ=-.41). However, the I-E scale was a more adequate predictor of information seeking, showing a correlation of -.53 with IS. To further explore the relationship between information seeking and locus of control, a median split was used to divide patients into internal and external groups on both the RLC and I-E. T-tests using information seeking as the dependent variable showed that internals as measured by the I-E scale sought significantly more information (IS $\bar{X}$=3.18) than externals (IS $\bar{X}$=2.30, t=2.02, $p < .05$), while no significant difference was found between internal and external groups as measured by the RLC.

Inspection of the intercorrelations among information seeking, hopelessness, I-E scale, and social contact indicated that I-E was negatively correlated to information seeking, social contact, and positively correlated to hopelessness. The remaining correlations were consistent; social contact and information seeking were negatively correlated to hopelessness. One possible explanation for these results is that internals actively sought information from physicians and solicited support from friends and family, and consequently felt less hopeless.

As predicted, the vulnerability measure of operative intervention was independent of the measures of coping effort and competency. However, a -.53 ($p < .001$) correlation between operative intervention and fear of surgery was an unexpected finding indicating that greater expressed fear was associated with less excision in the subsequent operation.

Among the validational instruments, concurrent validity of the Hopelessness scale was demonstrated by consistently negative correlations with social contact, information seeking, future satisfaction, estimate of health, and expectations for recovery. The one item scales of expectations of outcome, future satisfaction, and estimate of health showed consistent positive correlations with one another.

Postoperative Variables

Descriptive data on the postoperative variables are presented in Table 6. The most important information was the absence of a significant mean change in the patients' subjective report of welfare and recovery from postoperative days three to seven. It is possible that patients did not experience significant changes in their physical or emotional status during this early period of recovery. On the other hand, the positive skew and relatively narrow range of the score distribution on the Welfare Inventory may indicate that it was insensitive to changes in emotional welfare. In contrast, the percentage of time spent out of bed clearly reflected changes in status from day three (%OB3 $\bar{X}$=.24) to day seven (%OB7 $\bar{X}$=.41) and may have been a more sensitive measure of progress during this immediate recovery period.

Table 6

Mean, Standard Deviation, Range of Postoperative Variables

Variable	Mean	SD	Minimum	Maximum
SICU	79.26	163.93	12.00	990.00
Hospital[1] days	11.68	5.54	5.00	32.00
Pain medication	93.41	62.45	15.20	302.10
Welfare Inv. #3	15.34	4.63	5.00	20.00
Welfare Inv. #7	15.77	4.69	4.00	20.00
Recovery Inv. #3	30.06	8.49	12.00	45.00
Recovery Inv. #7	33.87	10.65	10.00	53.00
%Time out of bed #3	.24	.21	0.00	1.00
%Time out of bed #7	.41	.31	0.00	1.00
Phy. Rating #3[2]	3.57	1.07	1.00	5.00
Phy. Rating #7[2]	3.34	1.34	1.00	5.00

Note[1] n = 28
Note[2] n = 30

The general question concerning the postoperative variables is the extent to which they were intercorrelated or the degree to which particular measures contributed independent information. A related question is the nature of the interrelationships that existed among the three criterion sources: physicians, patients, clinical indices. As an initial step, the postoperative variables correlation matrix was calculated and appears in Table 7. The first three measures are clinical indices, the next eight are derived from patient self-reports, and the last two are physician ratings.

As can be seen, the patients' self-ratings were generally intercorrelated from low to high levels with one another, while the clinical indices were relatively independent of each other and the ratings. The physician's ratings were also relatively independent from the other criterion sources. The one striking exception was the number of days spent in the hospital by survivors, which was negatively correlated with the recovery score, the percentage of time out of bed on the seventh day, and physician's ratings. The relationship between days-in-the-hospital and physician's ratings is not surprising since the discharge date was determined by the physician, and was consequently another measure of the physician's evaluation of the patient's progress. Since physician's ratings were also positively correlated to time out of bed and the patient's seventh day recovery score, it is possible that the physicians were using the patient's return of physical mobility and self-report of subjective physical state as markers of readiness for discharge.

Among the self-report measures, the time out of bed on the third postoperative day was not related to any of the other measures and

Table 7

Correlations among Postoperative Variables

	Hospital[1] days	Pain medication	Welfare Inv. #3	Welfare Inv. #7	Welfare Inventory	Recovery Inv. #3	Recovery Inv. #7	Recovery Inventory	%Time out of bed #3	%Time out of bed #7	Phy. Rating #3	Phy. Rating #7
SICU	-.12	.06	-.10	-.10	-.11	-.15	-.07	-.12	-.12	-.17	.06	-.11
Hospital[1] days	1.00	.14	.02	-.15	-.07	-.26	$-.33_a$	$-.36_a$	-.08	$-.44_b$	$-.45_a$	$-.72_c$
Pain medication		1.00	-.05	-.16	-.10	-.25	-.10	-.19	.04	.13	.04	.07
Welfare Inv. #3			1.00	$.71_c$	$.92_c$	$.54_c$	$.45_b$	$.60_c$	.02	.27	.05	.06
Welfare Inv. #7				1.00	$.55_c$	$.37_a$	$.53_c$	$.57_c$	-.15	$.31_a$	.10	.10
Welfare Inventory					1.00	$.48_b$	$.55_c$	$.63_c$	-.06	$.33_a$	.10	.10
Recovery Inv. #3						1.00	$.38_a$	$.76_c$	.15	.26	.02	.15
Recovery Inv. #7							1.00	$.86_c$	-.03	$.63_c$	.19	$.39_a$
Recovery Inventory								1.00	.03	$.51_b$	.13	.27
%Time out of bed #3									1.00	.12	.25	.29
%Time out of bed #7										1.00	$.42_b$	$.44_b$
Phy. Rating #3											1.00	$.75_c$

Note[1] n = 28

a $p < .05$
b $p < .01$
c $p < .001$

appears to be an independent aspect of recovery. By the seventh day, this variable was moderately to strongly related with measures from each of the three criterion sources. As expected, the Welfare Inventory and Recovery Inventory were positively correlated with one another.

Relationships between Preoperative Variables and the Recovery Course

The primary objective of this analysis was to test the main hypotheses that greater coping effort, more effective competencies, more social support, and lower vulnerability would be predictive of better recovery. The preoperative variables were entered into a stepwise linear regression analysis designed to assess the independent contribution of each variable to a criterion of one of the postoperative measures. In the first stage, a set of five preoperative variables were entered as predictors in stepwise fashion until no additional variable from the set was capable of producing a change in R^2 greater than .01 or where the overall F ratio of goodness of fit became non-significant ($p > .05$). The five variable set consisted of positive affect, social contact, information seeking, recovery locus of control, and extent of operative intervention. The high correlation of Hope and Positive Affect would introduce problems associated with multi-colinearity if both were entered as predictors, thus the more general measure of positive affect was retained and the measure of hope was deleted. The measure of physical effort was analyzed independently, since entering it into the equation would reduce the overall sample size to n=26.

Six such regressions were performed, one each for: amount of pain medication, number of days hospitalized, average welfare score, average recovery score, percentage time out of bed on the third day, and percentage time out of bed on the seventh day.

Since age was significantly correlated with time in SICU and the INDEX measure of recovery, regressions onto these criteria were done in two steps. In the first step, the age variable was entered into the equation in order to statistically equate patients and provide a relatively unbiased test of the hypotheses. During the second step, the five preoperative variables were allowed to enter in stepwise fashion. Two such analyses were performed, one each for time in SICU and the INDEX score.

In the second stage, an additional stepwise regression was performed, at this point allowing the measure of physical effort to enter in stepwise fashion, where it had been shown in the previous independent analysis to be significantly correlated with the dependent variable.

From inspection of Tables 8 and 9, in which the results of the tests of the main hypotheses are given, the absence of a strong or consistent relationship between individual preoperative predictors and any of the postoperative criteria is immediately evident. As Table 8 indicates, the only two predictors which contributed independently to criteria were Positive Affect to days-of-hospitalization and Recovery Locus of Control to amount of pain medication. At the overall level, various combinations of preoperative variables predicted at significant levels to dependent criteria of time in SICU, days-of-hospitalization, pain medication, INDEX of recovery, and the Recovery Inventory, although inspection of the coefficients of determination, R^2, indicates that only 22 to 30 percent of the variance in the recovery criteria was accounted for. The regression analyses for the four patient self-report measures (Table 9) showed that only the subjective report of physical status was significantly related to the predictors.

Table 8

Regression Analyses of Predictor Variables to Clinical Indices and INDEX

	Time in SICU		Days of hospitalization		Pain medication		INDEX of recovery	
Predictor variable	Simple R	Beta weight	Simple R	Beta weight	Simple R	Beta weight	Simple R	Beta weight
Positive affect	-.24	-.30	.46[b]	.43[a]	.17	.12	.12	
Recovery Locus of Control	-.03		-.24	-.17	-.43[b]	-.38[a]	.04	
Information seeking	.25	.19	.04		.00		-.06	
Social contact	.00		-.05		.36[a]	.29	-.18	-.24
Extent of Operative intervention	.30[a]	.25	.02		-.01		.32[a]	.25
Age	.35[a]	.30					.33[a]	.31
R^2	.30		.24		.29		.22	
F	3.27[a]		3.93[a]		3.76[a]		2.94[a]	

a $p < .05$
a $p < .01$

Table 9

Regression Analyses of Predictor Variables to Self-report Measures

Predictor variable	Welfare Inventory		Recovery Inventory		Percentage time out of bed-Day3		Percentage time out of bed-day7	
	Simple R	Beta weight	Simple R	Beta weight	Simple R	Beta weight	Simple R	Beta weight
Positive affect	-.24		-.28[a]	-.29	-.15		-.17	
Recovery Locus of Control	.10		-.17		-.20		-.12	
Information Seeking	.16		.14		.12		.19	
Social contact	.24		.28[a]	.31	.16		.05	
Extent of operative intervention	-.29[a]		-.27	-.25	.04		-.25	
R^2			.24					
F(regression)	ns		3.11		ns		ns	

a $p < .05$

In an independent analysis, the measure of physical effort was shown to be significantly correlated with the postoperative criterion days-in-the-hospital ($r=-.48$, $p < .01$). The results of the stepwise linear regression analysis in which physical effort was allowed to enter to days-in-the-hospital are summarized in Table 10. The results were consistent with earlier regressions, in that no one variable contributed independently to length of hospitalization, although the overall test was significant and 52% of the variation in the criterion could be accounted for by the predictors.

Inspection of the signs and values of the beta weights indicates that higher expressed positive affect was generally associated with poorer recovery on all criteria except time in SICU. This is opposite to what had been predicted. In contrast, the measure of physical effort functioned as predicted, although on only one recovery criterion. Low scores on the RLC, which suggest an internal locus of control, were associated with increased use of pain medication and longer postoperative hospitalization. The remaining beta signs show a consistent trend whereby a more internal locus of control was associated with more adequate recovery. Post hoc analysis showed that the Rotter I-E scale did not significantly predict use of medication, nor was it related to any of the other recovery criteria, confirming the assumption that a specific measure of locus of control would be more powerful than a general dispositional measure. Social contact was significantly correlated to use of pain medication and self-estimates of recovery, although it did not make an independent contribution at the multivariate level. Greater extent of operative intervention was similarly related to more time in SICU, and lower self-estimates of recovery and

Table 10

Regression Analysis of all Predictor Variables to Days-of-hospitalization[1]

Predictor variable	Simple R	Beta weight
Positive affect	.46$_b$	.36
Recovery Locus of Control	-.24	-.35
Information seeking	.04	-.17
Social contact	-.05	-.20
Extent of operative intervention	.02	
Physical effort	-.48$_b$	-.42
R^2		.52
F(regression)		3.30$_a$

Note[1] n = 21

a p. < .05
b p. < .01

welfare. Age, which can also be considered an inherent measure of vulnerability, was positively correlated to time in SICU.

Several post hoc analyses were also done to further inspect the relationship between preoperative variables and the recovery course. Comparison of survivors and nonsurvivors on the preoperative variables yielded no significant differences. This held true across all psychological, physiological, demographic, hospital setting and operative intervention variables. Clearly, there was a major source of variation in outcome that was uncontrolled in this study, particularly for the nonsurvivor subset. Although fear of surgery has been extensively studied in previous investigations, here it was only found to be related to amount of pain medication ($r=.36$, $p. < .05$). However, it was not significantly correlated to the responses concerning intensity and amount of pain on the Recovery Inventory. The Beck Hopelessness Scale was negatively correlated to the average welfare score ($r=-.36$, $p. < .017$), but was otherwise unrelated to the recovery course. The three one-item scales assessing future satisfaction, expectancy for recovery, and quality of life were not related to postoperative outcome.

CHAPTER IV

DISCUSSION

In the present study, age was the only demographic variable which predicted significantly to recovery. Since increasing age in this generally older sample was probably indicative of increased susceptibility to disease and physical stress, it can be considered an additional measure of vulnerability that had been originally unspecified. Factors related to hospital of admission, SES level, marital status, and race did not directly relate to recovery and consequently were not sources of confounding.

As predicted, the verbal content measures of hope and positive affect were independent of negative affects and did not vary as a function of patient's background. These results were consistent with previous findings that trace measures of positive and negative affects are independent of each other (Westbrook, 1976). Thus, there is increasing evidence that to fully understand a person's experience of events, assessment of positive as well as negative feelings is needed. However, the high correlation between the specific measure of hope and the general measure of positive affect used here would indicate that considerable work is still needed to differentiate the set of positive feelings into more discrete dimensions or categories. As seen in the present study, the respective intercorrelations between these two verbal content measures and the remaining preoperative measures and

the postoperative measures were nearly identical, and indicated that the two scales were not differentially discriminating the patient's experience or variation in recovery. Since there is little basis for referring to hope and positive affect as separate experiential phenomena, positive affect will be used in the rest of the discussion as a general term implying the full range of positive feelings.

Who was experiencing relatively greater positive affect in the face of life threatening illness and major surgery? The correlations were moderate, but there was some indication that those patients tending towards an external recovery locus of control ("recovery externals") and who expressed greater expectations of future satisfaction experienced more positive affect preoperatively. However, positive affect did not vary directly with physical effort as predicted, but in fact showed a negative correlation. On the basis of these findings, concurrent validity among the three hypothesized measures of coping effort was not established. Subsequent analysis of the relationship between coping effort and the recovery course demonstrated that the association between positive affect and recovery was consistently in the poor direction, while more physical effort during a preoperative examination was predictive of less time in the hospital. These latter results can be interpreted as indicating that patients who were disposed to try harder when confronted with physical tasks of treatment were able to regain minimal levels of mobility and functioning more quickly and leave the hospital earlier. Clearly, more evidence was obtained demonstrating that physical effort is a valid measure within the general domain of coping effort than was obtained for positive affect.

The indirect relationship between positive affect and recovery is puzzling. It is possible that a mediating cognitive variable, such as selective inattention, cognitive misperception, or denial led patients at risk to be somewhat naive and to experience unrealistic feelings of optimism. Perhaps, as Janis (1958) posits, the optimistic patients were not experiencing sufficient fear or anxiety to motivate "worry work" or effective coping action. This possible explanation is indirectly supported by the finding that greater physical effort was associated with greater expressed fear of surgery. Although fear itself was not strongly related to the recovery course, perhaps it has its effect by motivating responses such as physical effort.

The possibility that patients expressing high positive affect did not take an active problem solving approach to their illness and recovery is further suggested by the moderate positive correlation between positive affect and the RLC. It was noted by the investigator that "recovery externals" would typically make many positive statements regarding their trust in physicians' and God's capacities to care for them, and it is possible they were unaware of the effort or tasks expected of them during recovery.

The RLC demonstrated adequate internal consistency, although the alpha reliability can be expected to drop somewhat on subsequent samples. Concurrent validity for the RLC was shown by a moderate correlation with the established Rotter I-E scale. The shared variance between the measures was sufficiently low to enhance discriminant validity. The new scale successfully predicted extent of information seeking prior to surgery, although the I-E scale was a better predictor during the preoperative period. The more accurate test of the utility

of the new scale showed that behavior during the recovery period was consistent with locus of control hypotheses, when internal-external expectations were assessed with the RLC. The more general I-E scale was not predictive to the recovery period. Thus, the findings provide preliminary evidence of the construct validity of the RLC and demonstrate the utility of a more specific recovery related measure.

The relationship of locus of control orientation to recovery is probably limited to those aspects of the treatment setting somewhat under patient control. The results from this investigation were consistent with earlier findings that internals seek more health related information (Seeman & Evans, 1962; Wallston, Maides & Wallston, 1976; Wallston, Wallston, Kaplan, & Maides, 1976), have longer post-operative hospital stays and receive more pain medication following surgery (Johnson et al., 1971). These findings can be interpreted as suggesting that internals make more effort than externals to self-manage their pain, anxieties, and disability through requests and communications to the staff, and consequently receive more medication and lengthier treatment.

Although the original item pool for the RLC consisted about evenly of internally and externally worded items, seven of the eight items in the final scale were externally worded. The internally worded items did not correlate with the final scale, nor were they internally consistent with one another. These findings are consistent with other evidence that locus of control may consist of at least two orthogonal dimensions (Levenson, 1973; Wallston, Wallston, & DeVellis, 1978). Specifically, these researchers are suggesting that internal beliefs may be orthogonal to external beliefs, and that external fate

and chance beliefs should be considered separately from external control by powerful others. From the perspective of this model, the RLC is primarily a measure of external expectations regarding fate and chance in the recovery environment. Development of additional scales to assess dimensions of external expectations from physicians and staff and to tap internal beliefs would potentially enhance prediction to the recovery period. Additionally, generalizing item content to the broader context of hospitalization might improve the new scale's prediction to behavior during the preoperative period. In this study, the generalized Rotter I-E scale was a better measure of preoperative locus of control beliefs.

In addition to seeking more preoperative information, internals, as measured by the Rotter I-E scale, received more preoperative social contact, reported higher expectations of future satisfaction and recovery outcome, made a higher self-estimate of their current health, and endorse fewer statements of hopelessness and despair. As already suggested, these results could be interpreted as meaning that internals felt less hopeless and had higher expectations for the future as a consequence of their efforts to control the environment by seeking support and soliciting information. However, analysis of the demographic variables indicated that lower class patients received less social contact, sought less information, and adopted a more external locus of control. Consequently, the difference between internal and external patients may be partially a function of SES factors. For example, most of the lower class patients in both hospitals had been referred from rural clinics or out of state physicians, while many of the middle class patients, particularly in the Shands,

were local residents. Thus, the lower social contact among lower class patients may have been a function of the inability of their relatives to travel to visit, rather than a reflection of their external locus of control orientation.

Although information seeking varied as expected with locus of control, it was not an independently significant predictor of recovery. This finding is consistent with Sime (1976), who found no relationship between a patient's self-report of preoperative information seeking and standard clinical indices. However, Sime (1976) did find that information seeking was positively correlated to amount of information obtained, and that amount of information interacted with levels of fear. Increased information benefited most those who reported high preoperative fear, as measured by their use of analgesics, sedatives, and days-of-hospitalization. Other research has shown that information is most helpful when it provides instruction in specific recovery enhancing activities or strategies aiding cognitive appraisal and ego-defensiveness (Egbert et al., 1964; Healy, 1968; Johnson & Leventhal, 1974; Langer et al., 1975). Since the amount and type of information obtained is at least partially a function of the extent and effectiveness of the patient's information gathering strategies, future research could improve upon the understanding of this aspect of competence by assessing qualitative dimensions. For example, collecting information about the extent and nature of illness may not be as effective in preparing for surgery as inquiring about the effects of surgery, the nature of the recovery room, and the behavior expected of the patient during treatment.

It was seen that increased social contact was related to greater use of pain medication and more positive self-reports of physical status during the postoperative period. Given the descriptive-correlational design of this study, it is not known whether social support was an etiological factor to these recovery criteria, or whether it was simply covarying with other factors, such as locus of control or SES. It is significant, however, that a measure as simple as the one used here showed any relationship at all to the preoperative and postoperative experience. This preliminary evidence could be improved with more thorough assessments of the hospital milieu, family-patient characteristics, and the patients' roles in social and vocational networks.

The study did not directly test the hypothesized inter-relationships between vulnerability, coping effort, and competency, although as predicted, the vulnerability measure used here was independent of the coping measures. The vulnerability measure also consistently predicted to outcome; extent of operative intervention was significantly related to three of the recovery criteria and evidenced marginally significant relationships to two others. It was shown that an additional measure of vulnerability, age, was significantly related to time in SICU. These findings suggest that increasing attention must be given to identifying additional sources of vulnerability, such as length and severity of illness, physical stamina, and operative factors. This seems true for both theoretical and practical reasons: twenty percent of the resected group died, and there were no variables discriminating survivors from nonsurvivors.

A basic assumption of the vulnerability model is that if patients are equally "at risk," with respect to inherent vulnerability to postoperative complications (distress, death, slow recovery), coping factors should predict to variability in outcome. To test this assumption, one might define a group of Hi Vulnerability patients with measures of inherent risk and use recovery criteria to divide them into groups of Hi Vulnerability-Poor Recovery and Hi Vulnerability-Good Recovery. If the assumption holds, measures of coping effort and competency should discriminate between patients in the two groups.

However, finding valid measures of recovery outcome will continue to be a problem in such analyses. It was found that during the first week of recovery, different criterion sources of information (patients, physicians, clinical indices) did not generally overlap. Undoubtedly, some measures will be found to lack construct validity as accurate measures of the recovery period. A particular need exists for nondemanding self-report measures to assess the patient's immediate emotional responsivity and physical progress. But the accumulating evidence would suggest that recovery proceeds along a number of parallel, but independent, courses. Rather than making a general prediction to recovery from specific preoperative variables, increased emphasis should be placed on stating precise relationships to particular outcomes. The parallel response model (Leventhal, 1975) is one means of generating such statements.

An additional problem concerns the definition of "good" and "poor" recovery. For example, longer hospitalization and increased use of pain medication have typically been indicators of a poor recovery course. However, one might also wonder whether external

locus of control patients, who receive less medication and tend to be discharged earlier, were adequately treated. Similarly, ambulation can be expected to increase as strength and energy returns and pain subsides, but excessive ambulation during the immediate period may be detrimental to the patient and possibly a marker of agitation rather than improved functioning. Development of adequate criteria is also hampered by the lack of base rate data for different operative procedures.

The changing nature and tasks of recovery over time is another related issue. It is strongly suspected that the weak relationship found in this study between preoperative measures and recovery outcome was at least partially a function of the recovery period under study. The findings here were consistent with other investigations showing that immediate outcome does not tend to be strongly related to psychological factors (Heller et al., 1974; Wolfer & Davis, 1970). The additional finding that the best prediction could be made to the one longer term criteria (days-in-the-hospital) in the study also supports this explanation. The overall findings suggest that coping factors identified thus far will be most predictive of response during the later stages of recovery as the patients become less dependent upon hospital staff and must rely upon their own resources and competencies. It was the investigator's impression that any potential differences in immediate recovery due to an individual patient's strengths or weaknesses were overcome by the massive medical care provided. In effect, hospital staff assume major coping functions for the patient.

The question remains, however, as to what factors contribute to variability during the immediate period. This is a particularly

relevant concern to high risk procedures, such as the one investigated here. Operative mortality was not related to the psychological, physiological, setting, or operative variables assessed in the study. If the assumption is correct that psychological factors do not play a major role in immediate outcome, increased attention to operative technique and vulnerability variables may improve prediction of catastrophic outcome.

An additional explanation for the weak association found between preoperative and postoperative criteria concerns methodological issues. Although the vulnerability model suggested that coping effort variables would be potentially the most sensitive to outcome, hope and positive affect did not demonstrate concurrent or construct validity, and the third measure, physical effort, was only related to one measure of recovery. As already discussed, more precise measures of competency and social factors are also needed. Finally, if coping factors do play only a small role during immediate outcome, larger sample sizes and replication will be needed to observe small but reliable relationships. With the relatively small sample used here, the amount of variation in outcome that could be accounted for was not large, and further decreases would be expected if the multiple regression equations were cross validated.

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APPENDIX A

Recovery Locus of Control Scale Items

Item	Corrected item to scale correlations
1. A good fast recovery from surgery is largely a matter of good fortune.	.50
2. No matter what I do, if I am going to have a slow difficult recovery, I will have a slow difficult recovery.	.20
3. So many complications can happen to you during recovery from surgery that you never know how or when one might occur.	.32
4. People who have an uneventful, quick recovery are just plain lucky.	.46
5. Without the right breaks, recovery from surgery will be slow and difficult.	.59
6. Trusting to fate will not be as effective as taking definite courses of action during recovery.	.21
7. So many unexpected things could happen during my recovery period that there is really no point in my learning everything I can about what I should do, now.	.32
8. This place is run by a few doctors, and there is nothing the patients can do to change things.	.38

Note: The scale is scored in the external direction, with each item scored from 1 (strongly disagree) to 6 (strongly agree) for the seven external items and reverse scored for the one internal item.

APPENDIX B

PHYSICIAN'S AND NURSE'S
PREOPERATIVE RATING FORM

PATIENT'S NAME _____

RATER'S POSITION: SURGEON (or Surgical Residents)

(please circle)

NURSE

ANESTHESIOLOGIST

Instructions: Please rate this patient with respect to how active he/she is in seeking information about his/her illness and treatment from you. Does this patient initiate discussions about his treatment or does he passively accept what you say without further inquiry? Does the patient ask you to clarify or further explain points of information or does he accept what he is told without asking for further elaboration or clarification?

PLEASE CIRCLE THE NUMBER ON THE SCALE BELOW that best indicates how actively this patient has sought information from you.

1	2	3	4	5	6
NO INFORMATION SEEKING					EXTREMELY ACTIVE INFORMATION SEEKING

APPENDIX C

Welfare Inventory Scale Items

Item	Corrected item to scale correlations
Comfortable	.31
Pleased	.40
Worried	.54
Uncertain	.52
Relieved	.50
Weary	.30
Depressed	.55
Satisfied	.39
Tense	.64
Annoyed	.64
Confident	.51
Relaxed	.60
Frustrated	.77
Uneasy	.68
Hopeful	-.04
Frightened	.53
Content	.60
Miserable	.46
Peaceful	.85
Encouraged	.49

Note: The patient is asked to indicate whether he is or is not experiencing each feeling. The scale is scored in the positive direction with each item scored 0 (no) or 1 (yes) for the positive affects and reverse scored for the negative affects.

APPENDIX D

Recovery Inventory Scale Items

Instructions: The purpose of this form is to get your evaluation of your condition right now. You may feel good about some aspects of your condition and very poor about other aspects. It is important for us to know this, so please try to be as frank as possible. No one but the project interviewer will see your answers.

Make your ratings simply by indicating whether you feel good, fair, or poor with relation to each of the following areas. Please make your judgements in comparison to how you usually feel at home.

Item	Scale			Corrected item to scale correlation
1. Appetite	Poor	Fair	Good	.44
2. Strength & energy	Poor	Fair	Good	.61
3. Stomach condition (i.e., upset, nauseated, vomiting)	Poor	Fair	Good	.57
4. Bowel condition (i.e., gas pain)	Poor	Fair	Good	.40
5. Ability to urinate	Poor	Fair	Good	.30
6. Ability to do things for yourself	Poor	Fair	Good	.66
7. Ability to move around	Poor	Fair	Good	.73
8. Interest in what is going on around you	Poor	Fair	Good	.46

	Item	Scale	Corrected item to scale correlation
9.	Your nursing care	Poor Fair Good	---
10.	Your medical care	Poor Fair Good	---
11.	How much pain have you had today?	None Very little Some Much Very much	.51
12.	How intense has the pain been today?	Very mild Mild Moderate Intense Very intense	.52
13.	How many times have you been out of bed today?		---
14.	About what percent of the time have you been out of bed today?		---

Note: The recovery score is a summation of items 1 thru 8 plus items 11 and 12. The remaining items are treated as separate indices. Items 1 thru 10 are scored 1 (poor), 3 (fair), or 5 (good). Items 11 and 12 are scored in a positive direction from 5 (none or very mild) to 1 (very much or very intense).

BIOGRAPHICAL SKETCH

Mark Raymond Otis was born on February 28, 1950, in Queens, New York, and spent the better part of his childhood and adolescence in Valley Forge, Pennsylvania. He graduated from Conestoga Senior High School in Paoli, Pennsylvania, in June of 1968. He attended Union College in Schenectady, New York, for the next five years, graduating with a Bachelor of Science in Psychology in June, 1973. Following his undergraduate education, he began graduate work in Psychology at the University of Florida, where he completed a Master of Science degree in Psychology in 1975 and continued to work toward the Doctor of Philosophy. He completed a Residency in Clinical Psychology at the University of Texas Health Science Center at San Antonio in August, 1978, and remained there to do a Second Year Residency while completing the dissertation. Upon completion of the Doctor of Philosophy he will begin work as a Clinical Psychologist.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Vernon Van De Riet, Chairman
Associate Professor of Clinical Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Franz Epting
Associate Professor of Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Jacqueline Goldman
Professor of Clinical Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Paul Schauble
Professor of Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Cynthia Belar
Assistant Professor of
Clinical Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Otto vonMering
Professor of Anthropology

This dissertation was submitted to the Graduate Faculty of the Department of Psychology in the College of Liberal Arts and Sciences and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the Degree of Doctor of Philosophy.

June, 1979

Dean, Graduate School